

*Brewer*

# INDUSTRY FUNDED RESEARCH AND DEVELOPMENT

A report on the reasons why independent research and development, essential to security and progress, should not be fettered by artificial external controls.



AEROSPACE INDUSTRIES ASSOCIATION  
1725 DE SALES STREET, N.W., WASHINGTON, D.C. 20036

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## PREFACE

In recent years, there has been increasing discussion, even heated debate, concerning research and development and bid and proposal technical activities performed by industrial firms on their own initiative. Research and development is innovative and adaptive effort directed toward generating and organizing new knowledge and making systematic use of that knowledge. (Except where otherwise indicated, the use of the term "research and development" in this paper excludes that research and development performed directly under contract with a customer.) Bid and Proposal activity is that technical effort to demonstrate a capability to fulfill a particular customer's need. It is evident that nearly all of the discussions have suffered from lack of a clear understanding of what these technical activities really are, why they are undertaken, how they are managed and paid for.

It is the purpose of this paper to contribute to a better understanding of those matters in order that future decisions can be made on the basis of facts viewed in their proper perspective. To the extent that this is achieved, future decisions will more clearly reflect reasoned and objective judgments.

It is essential to our national interests that recent decisions on these technical activities be promptly re-examined and changed to eliminate artificial external controls which have been imposed. Failure to do so will result in an irretrievable loss of part of one of our country's most important assets, the technical and productive competence of its industry. It should be remembered that this capability provides the products and services required for our national well being.

(This is a summary. Enclosed is a bibliography of some documents which deal with facets of this subject in greater depth.)

## WHY IS RESEARCH AND DEVELOPMENT PERFORMED?

Man inevitably strives for progress. Without progress generated through learning and the application of that learning, we would not have the kinds of homes in which we live; there would be no automobiles or airplanes, electricity or television sets; we would not have today's medical practices and medicines, or any other of thousands of things we now take for granted -- in short, we would be living neither as well nor as long.

Even though individuals sometimes express a fondness for the "good old days," it is certain that there are very few of us who really would be satisfied simply to maintain the status quo, much less to retrogress to a less-enlightened, less full life. Further progress desired by mankind can be achieved only through the continued acquisition and application of knowledge and technology.

Economic and social factors long ago caused the creation of organizations to produce most goods and services which previously had been produced solely by individuals. The character of these organizations varied with the different roles they were to perform in our economic and social structure. Industrial organizations as we now know them will continue to evolve in response to natural economic and social forces and probably will continue to be the optimum instruments for the creation and production of most goods and services.

Individual industrial firms and industry in total can only provide new and better products and services (in proper quantities and at proper prices as dictated by the economic laws governing supply, demand and competition) to meet changing consumer and national needs by doing the right kinds and amounts of research and development. Because not only the growth but even survival of industrial firms depends so heavily on competitive acceptance of their products and services, it is understandable that management gives highest priority and careful managerial attention to the direction and performance of these technical activities.

## WHY MUST RESEARCH AND DEVELOPMENT BE INDEPENDENT?

Industry-funded research and development can fulfill its vital role only if it is independent from artificially imposed direct external controls over either the kinds or degrees of such efforts or their costs.

Forces inherent in our competitive system operate automatically to guide research and development into appropriate channels and to constrain costs of these efforts within limits of practicality and reasonableness.

Prudent company management must tailor research and development in accordance with such factors as the competitive environment, its technical competence, the most productive uses of its resources and the relevance of the research and development to objectives of the company and its customers. In so doing, the management must have the flexibility to evaluate its research and development on a continuing basis and to redirect immediately the character or level of work on the basis of progress achieved or changes in needs. This ability to react promptly in expanding, curtailing, or redirecting efforts in response to technological discoveries, market demands and economic force is a vital factor in assuring successful and efficient performance of research and development which culminates in the creation of products and services to satisfy commercial and government needs.

Artificial external controls interfere with the automatic checks and balances of this system and thus adversely affect the quality and efficiency of these technical activities. In turn, this produces undesirable effects on the quality, timeliness, and prices of goods and services which would have resulted from unfettered creative technical efforts.

External control in the form of government direction as to what kind of effort should be performed, how much should be done, and/or who shall do it, is self-defeating and seriously jeopardizes our national interests for the following reasons:

First -- who in government is so omniscient as to be able to pre-determine specifically what research and development will be useful, how much it should take to do it right, and who is most likely to be successful? For example, would we now have such things as jet aircraft or television, if, instead of a great number of capable and dedicated organizations and people being free to conduct research and development independently, the effort had been limited by governmental direction? (Of course, there is a continuing need for the complementary kinds of technical efforts which have been, and are being, funded by government contracts and grants.)

Second -- maintaining effective competition is such a basic national policy that laws have been enacted to ensure adequacy of competition in the commercial marketplace. Similarly, the desire for adequate competition among potential suppliers of the government's needs also is manifest in laws and regulations. Inasmuch as technological capability is essential in establishing and maintaining an adequate body of industrial firms ready and able to compete in providing goods and services, any artificial controls over this independent technical effort can result only in reducing competition, a situation which would be in clear conflict with national policy.

## HOW IS RESEARCH AND DEVELOPMENT PAID FOR?

It is axiomatic that a business must generate income in excess of all of its costs and expenses or it will not survive.

A business generates income by offering products or services which customers are willing to purchase. The prices of those products or services include the costs of producing and marketing them plus a factor to serve the role of profit -- indispensable in a free-enterprise economy. The costs include the labor and materials which are used in producing the products and services and allocable shares of the many indirect (overhead) expenses necessary to operate the business. Included in these indirect expenses, for example, are managerial and clerical salaries and wages, payroll taxes, depreciation and maintenance of property used in the business, utilities, insurance, taxes, and research and development.

Thus, the business firm expends its own funds for all of these elements of cost, but it's the buyers of products or services who in fact "pay for" them through the prices of the products and services. Each buyer, however, "pays for" only the allocable share of these costs as a part of the price he pays for the product or service. This is true whether the buyer purchases a pound of hamburger, an automobile, a television set, a "round" on a golf course, or a filling in a tooth. It was once true with respect to the products and services required by the federal government to satisfy our national needs, including those in the fields of defense and space. It should again become true by the removal of statutory and regulatory restraints which operate to make the prices paid by the government exclude portions of the allocable shares of some costs.

Except for special complementary research and development projects specifically contracted for by the customer, no one customer -- government or commercial -- pays for research and development as such. Each customer pays only for the goods and services he chooses to buy. Only through the prices of goods or services sold can the producer recover his research and development costs.

In actual practice, the costs of research and development and related technical activities represent only a very small fraction, varying with the nature of the business, of the total costs of a product or service.

Also it is necessary to recognize that all costs, including those of the independent technical activities, must be and are carefully controlled by business firms so that the price a buyer is willing to pay for a product or service will recover actual costs as well as allow a margin for profit. If costs are not properly controlled, the producer will either price himself out of the market, or go broke selling products or services at prices which are below cost -- neither being an acceptable alternative for a business firm.



WHAT SPECIAL CONSIDERATIONS APPLY TO THE RELATIONSHIP  
OF RESEARCH AND DEVELOPMENT TO DEFENSE AND SPACE NEEDS?

There are some aspects of the relationship of research and development and related technical activities to defense and space needs which deserve special consideration.

One of these is that many of the products and services required for national defense and for achieving national objectives in space "push for state-of-the-art" to a much greater degree than do most commercial products and services. Therefore, research and development directed toward the government's defense and space needs is even more important to the nation and its citizens than is research and development directed toward other phases of our lives. Over-simplified, it is totally clear that the nation may exist without "a better mouse trap," but its survival is less certain without the goods and services vital for our security.

Another immutable fact is that research and development (and related technical activities) is only one -- albeit probably the most important -- element of the overall system which results in the government's obtaining products and services when it needs them, of proper quality, and at reasonable prices. These independent activities performed by industrial firms competing for government contracts complement the other facets of the system.

Some of the more recent policy changes designed to improve the procurement system make the performance of unfettered research and development even more necessary than before. Typical of such changes are those designed to better identify technical risks and take appropriate steps to minimize them before initiating expensive production programs -- for example, the "fly-before-you-buy" concept. If statutory or regulatory constraints are imposed on research and development and related technical activities, the overall system inevitably becomes unbalanced and will not function in the manner intended.

On some occasions, it has been alleged that national priorities require research and development directed toward our national defense be curtailed drastically and the funds thereby saved be used for curing serious social and economic problems.

The issue is not "either/or."

The United States has the resources to provide properly for the security of its citizens and to work toward curing social and economic ills. As a matter of fact, the cures depend to a significant degree on the kinds of technical activities that are necessary for our national security. Indeed, more and more improvements in our social and economic environment are direct results of the technology developed in our defense and space programs.

As defense and space spending declines, prudent business management naturally turns to other areas to ensure the company's future -- to other sectors of the government and to possible new or better consumer products. In any such redirection of all or a portion of a company's capabilities, the management

seeks to apply its technical resources most effectively to satisfy the needs of potential customers.

It has been alleged, on occasion, that there has been unreasonable growth in industry-funded research and development related to defense and space. In part, such allegations have been based on statistics which are not entirely comparable on a year-to-year basis.

More importantly, the facts are quite to the contrary. According to data published annually by the National Science Foundation (NSF), defense and space related research and development expenditures have lagged behind research and development related to the commercial marketplace even though defense and space needs are more closely tied to the frontiers of technology.

NSF statistics show that research and development expenditures associated with commercial products and services grew at an average annual rate of about 11 percent during the 1966-71 period. By contrast, the NSF data show that total research and development expenditures related to defense and space have remained relatively level during the same period, and actually declined at an average annual rate of about 3 percent during the last three years of the period.

The NSF data cited for defense and space-related research and development do not separate that which is industry-funded from that which is performed under contract. However, it is believed that the same general trends apply to both types of research and development.

The noted trends have been affected by inflation, especially during the latter years. Therefore, the reduction in defense and space research and development would be even greater if measured in a constant, such as man-years of effort.

## WHAT ARE BID AND PROPOSAL COSTS?

Another necessary cost of doing business that recently has received much attention and that on some occasions has been improperly combined with industry-funded research and development as if they were one and the same is "Bid and Proposal" expense. Bid and Proposal work is that technical effort, somewhat similar in nature but different in purpose and usually following industry-funded research and development, performed in demonstrating a company's capability to fulfill a particular need of a customer. Stated differently, it is this technical activity (often conducted at the request of a potential buyer) which must convince the buyer that the seller company can design and produce the article desired.

Because defense and space needs push the state of technology, the Bid and Proposal efforts related to defense and space programs tend to be much more extensive, particularly in justifying the technological basis for a new concept, than those needed in relation to most commercial transactions. The demands for adequate competition in the government's procurement of goods and services also generate a requirement for industry's expending resources in Bid and Proposal Work because at least several members of industry will respond to each separate government request for proposals even though not all of the responders will be successful in obtaining contracts.

Bid and Proposal work is a vital part of the government's procurement process. The cost of Bid and Proposal work are necessary business expenses incurred for the government's benefit and, to a great degree, their magnitude depends on the number and complexity of the government's requirements for products and services and on the amount of data requested by the government for purposes of evaluating industry's proposals.

It is apparent that there should be no artificial external controls which would interfere with the performance of bid and proposal work or would exclude from the prices of goods and services bought by the government portions of the allocable shares of bid and proposal costs.

## SUMMARY

Research and development is an absolute necessity. It is essential to the security and to the economic growth of the United States.

Research and development funded by United States industry, called Independent Research and Development (IR&D) in some government regulations, is an extremely important segment of the national creative effort which should not be constrained by artificial external controls.

Bid and Proposal (B&P) work is an essential element of the procurement process by which a company demonstrates its capability to fulfill the customer's needs. Both IR&D and B&P are essential tools for maintaining technical capability and adequate competition and for assuring higher quality and lower cost goods and services.

As long as industry is free to perform independent research and development, it has the flexibility necessary to take actions called for by changing technology and changing conditions -- to increase, decrease or change programs as required. Government has neither a monopoly on good ideas nor the ability to predetermine what needs to be done or who should do it.

The sometimes cited growth in research and development costs related to defense and space is more imagined than real. NSF data show that there has been an actual decline during recent years, a matter which should be recognized as a trend adverse to our national interests.

No customer, government or commercial, "pays for" IR&D or Bid and Proposal costs as such. These costs are included in determining the selling prices of goods and services. Obviously, the selling price must exceed costs incurred or the firms will not survive. Both the competitive marketplace and management control the direction and the amount of expenditures in a natural way, obviating the necessity for artificial external controls.

The survival of the United States and our ability to meet changing national priorities require a continuing national effort in research and development, including independently conducted research and development by industry.

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(Note: This bibliography lists some material heretofore published dealing with the subjects covered in this paper. Many of the items listed related to a particular proposal then being considered; nevertheless, reference to them may be useful.)

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